3.6.2 Command Requests

The IST allows a user to submit command requests to the Ops Controller. The Ops Controller is authorized to accept or reject the command requests. Requests that are accepted are executed by the Command Activity Controller (CAC) at the specified time. As noted in previous sections, only one user per spacecraft (i.e., the CAC) is allowed to issue real-time instrument commands. Therefore, the command request is the method by which an authorized IST user specifies real-time instrument commands that cannot be accommodated through normal planning and scheduling activities. A command request consists of a set of instrument commands and instructions. The instrument commands are specified to the CAC in the form of a procedure. The instructions include free-form text that conveys any pertinent information to the CAC regarding the execution of the procedure.

An IST user can access the Command Request Status window (Figure. 3.6.2-1) from the Tool menu on the Control Window. Once the Command Request Status window is activated, an IST user can perform any of the following activities:

- view the status of the command requests (for a selected spacecraft),
- view an existing command request,
- create a new command request, or
- create a new command request using a previously submitted command request.

The Command Request Status window includes a scrolling area that contains information for the command requests submitted to the Ops Controller. Each entry in this list includes the following:

- command request Id,
- request subject,
- request originator,
- date submitted,
- spacecraft subsystem or instrument Id,
- date acted upon by the Ops Controller, and
- status (pending, accepted, rejected).

An IST user can select any entry in this list and expand it to see the instructions and procedure references in the corresponding command request. This can be done by invoking the Command Request Evaluation window (Figure. 3.6.2-2) from the status window. A user may activate the Procedure Builder to see the contents of the procedure referenced in the Command Request. Valid request status values include:

- pending - the request has been received by the Ops Controller, but not acted upon.

- accepted - the request was evaluated and accepted by the Ops Controller, but has not been merged by the CAC. The procedure will be merged with the currently executing ground script directives according to the instructions specified by the IST user.

- rejected - the Ops Controller has determined that execution of the command request will adversely affect on-going commanding activities. The Ops Controller must provide a reason for rejecting the request.

An IST user may use the Command Request Creation window (Figure 3.6.2-3) to build and submit command requests. The Command Request Creation window is activated by the Command Request Status window. The Command Request Creation window provides input fields for the request subject, spacecraft subsystem/instrument Id, and the instructions. The originator, and status fields are filled in automatically. A procedure selection dialog allows an user to specify procedures for the request. If a procedure containing the appropriate instrument commands does not already exist, the Procedure Builder can be activated to create a new procedure. An argument editor dialog allows an user to edit the argument value for a selected command request's procedure. An IST user may use the time selector dialog to specify an execution time for a procedure.

An IST user may also select one of the existing requests from the submitted list and modify it. The modified request will be submitted as a new request to the Ops Controller.

ID	Request Subject	Originator	Date Submitted	Date Acted	Sub-system	SC ID	Status
1	proc 5 & 7	R. Moore	10/01/95		MISR	AM1	pending
2	proc 3	R. Moore	10/02/05	10/04/95	MISR	AM1	rejected
3	proc 12	A. Casey	10/10/05	10/11/95	MISR	AM1	accepted

Command Request Status

Close   Create   Evaluate   Refresh   Help

Figure 3.6.2-1. Command Request Status Window

Figure 3.6.2-2. Command Request Evaluation Window

Command Request Creation

Subject: proc 5 & 7

Request Status: New

Instruction:

Originator: R. Moore

Please execute proc5 at certain time. If there is a problem, please contact R. Moore at 123-4567.

Subsystem ID: MISR

Spacecraft ID: AM1

Selected

Proc.	Syntax	Validation	Time	Directive
proc 5	PASS	PASS	1999/167 00:00:03	start proc5()
proc 7				
:				
:				

Select Procedure | Remove Procedure | Select Time | Argument Editor | Procedure Builder

Submit | Cancel | Help

Figure 3.6.2-3. Command Request Creation Window

3.6.3 Command Monitoring

The IST allows a user to monitor the execution of the current ground script. A ground script consists of time-ordered, time-stamped directives that govern the command activities for a spacecraft and its instrument payload. A ground script is defined using the activities identified during the planning and scheduling process. Only a user with command authority has the privilege to control the execution of a ground script.

A user can monitor the execution of the ground script via a Command Monitor window (Figure 3.6.3-1). This window may be accessed from either the Tools menu on the Control window or via a command language directive. The Command Monitor window displays the current ground script directives in a scrolling text area. An IST user can scroll up and down to view previously executed directives, the currently executing directive, and future directives. Previously executed directives include a status. This status indicates the verification status,

depending upon which verification checks are enabled, for command directives. The verification checks include prerequisite state checking, command verification (command received by the spacecraft), and telemetry verification (command executed by the spacecraft/instrument). A countdown timer will be displayed for the next three non-comment directives in the ground script. In addition, the Command Monitor window displays the following ground script information:

- time frame covered by the ground script,
- ground script status (active, suspended),
- spacecraft Id,
- processing mode,
- prerequisite state check verification indicator,
- command verification indicator,
- telemetry verification indicator, and
- bias time.

An IST user can also search the ground script using a find dialog window. A user can search the ground script for a specified:

- time-stamp,
- directive,
- procedure reference, or
- text string.

The Command Monitor window also allows an authorized IST user to access the Command Request window. From the Command Request window, a user may send commanding instructions and procedures to the FOT for execution. The Command Activity Controller is responsible for merging procedures into the ground script. All updates to the ground script, via command requests or manually entered commands, will be reflected in the Command Monitor window.

```
┌─────────────────────────────────────────────────────────────────────────┐
│                          Command Monitor                                  │
├─────────────────────────────────────────────────────────────────────────┤
│  File  Utility                                                     Help   │
├─────────────────────────────────────────────────────────────────────────┤
│  G/S Start Time: 166/22:53:44    S/C ID: AM-1    G/S Status: Active    Bias: 00:00:00 │
│  G/S Stop Time: 167/13:22:14     Mode: Auto      PSC: On   CV: On   TV: On │
├─────────────────────────────────────────────────────────────────────────┤
│  Time        Command/Directive                      Status                │
│  ─────────────────────────────────────────────────────────────────────   │
│  167/00:02:00  #                                    * Comment         ▲   │
│  167/00:02:00  # Open MISR Cover                     * Comment         █   │
│  167/00:02:00  /MICOVER OPEN                         * CV, TV Pass     █   │
│  167/00:02:00  # Turn on the Camera                  * Comment         █   │
│  167/00:02:15  /MICAMERA ON                          * CV, TV Pass     █   │
│  167/00:02:15  # Enable each PS                      * Comment         █   │
│  167/00:02:15  /MiCPSAa ENABLE                       * CV, TV Pass     █   │
│  167/00:02:15  /MiCPSAf ENABLE                       * CV, TV Pass     █   │
│  167/00:02:15  /MiCPSAn ENABLE                       * Disable            │
│  167/00:02:15  /MiCPSBa ENABLE                       * CV, TV Pass        │
│  167/00:02:15  /MiCPSBf ENABLE                       * Skip               │
│  167/00:02:15  /MiCPSCa ENABLE                       * Skip               │
│  167/00:02:15  #                                     * Skip               │
│  167/00:02:15  #                                     * Skip               │
│  167/00:02:15  # Wait                                * Skip               │
│  167/00:02:15  #                                     * Comment            │
│ [167/00:02:30  WAIT                                  * Waiting         ]   │
│  167/00:02:30  #                                                           │
│  167/00:02:30  #                                                      █    │
│  167/00:03:15  /MiCPSLa ENABLE                       ▐00:00:23▌        █    │
│  167/00:03:15  /MiCPSMa ENABLE                       ▐00:00:23▌        █    │
│  167/00:03:15  /MiCPSTa ENABLE                       ▐00:00:23▌        ▼    │
└─────────────────────────────────────────────────────────────────────────┘
```

Figure 3.6.3-1. Command Monitor Window

An IST user may also print the current ground script. A print dialog window may be accessed from the Command Monitor window. A user may specify the output device (e.g., printer, file), the format (e.g., ASCII, postscript, etc.), and the orientation. The print image will include the general ground script information (e.g., name, spacecraft Id, etc.), the ground script directives, and any associated directive status information.

3.6.4 Ground Script Displays

The IST allows a user to view or print ground scripts generated by the Command Management Subsystem. These ground scripts include those that have already been executed, are currently executing, and will be executed in the future. Unlike the Command Monitor window, which displays the current ground script as it is executing, the Ground Script Display window provides an IST user with a read-only display of a specified ground script.

An IST user may access the Ground Script Display window (figure 3.6.4-1) from either the tool selection dialog or via a command language directive.
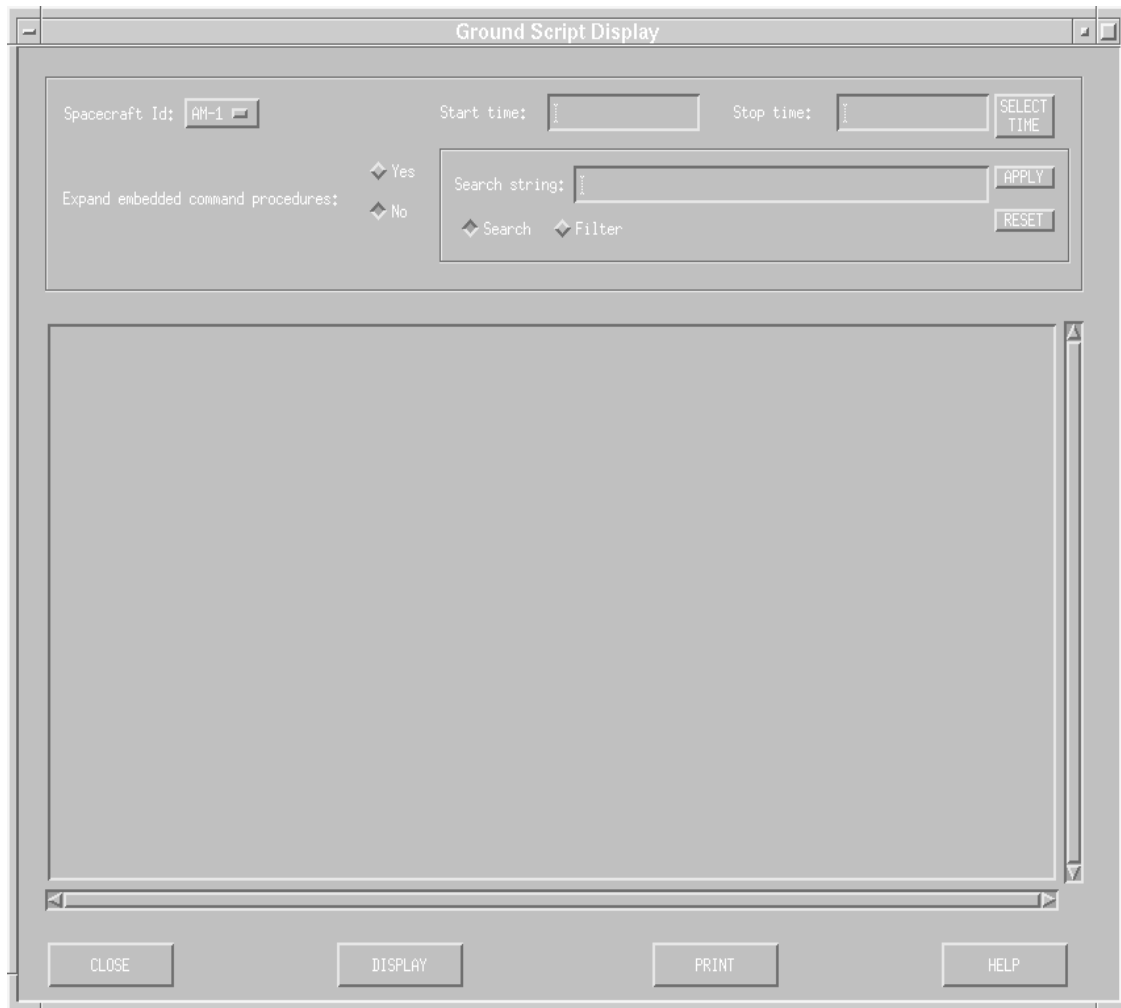
Figure 3.6.4-1. Ground Script Display Window

An IST user may view the ground script by providing constraints on which the ground script will be based. These constraints include:

- the spacecraft to which the ground script belongs
- the starting time of the ground script
- the stopping time of the ground script

In addition, the user may specify that the embedded command language procedures in the ground script be expanded.

An IST user may then perform search operations on the ground script based on a user provided search string. A user may search for the next line or display only those lines having this string. A user may then re-display the viewing ground script in its entirety.

An IST user may also print a ground script. A print dialog window may be accessed from the Ground Script Display window. A user may specify the output device (e.g., printer, file), the format (e.g., ASCII, postscript, etc.), and the orientation. The print image will include the general ground script information (e.g., name, spacecraft Id, etc.) and the ground script directives.

3.7 Event Processing

The IST user can view event messages. Event messages are informational text messages about the EOC, ISTs, spacecraft, and instruments. Event messages are color coded on the event display to indicate the event severity and event type. Events can be informational (e.g., indications of user actions), warning, and danger messages (e.g., spacecraft limit violation). An audible alarm will also notify the user of critical events. The IST user can view events in real-time, or view event history. Real-time events are displayed as they happen. Historical events are displayed upon a time, event type, and subsystem filtered request. Each event message contains a spacecraft id, instrument type, spacecraft subsystem, event message type, and textual information.

All EOC and IST components can generate events. For instance, the command subsystem may generate events on real-time commands, the telemetry subsystem may generate events on spacecraft and instrument status, while the Communications and System Management Segment (CSMS) may generate events on network status and security violations. The IST user can generate quick message events. Quick message events are messages up to 240 characters that can be sent to notify another user (e.g., user name), a type of user (e.g., command activity controller) or EOC site (e.g., MISR IST). Quick message events will also be color coded by severity.

The event display window (Figure 3.7-1) contains a graphical timeline indicating the occurrence of events, a chronological listing of event messages, and event filtering options. The total number of events, and filtered events are also indicated in the event window. Each event is represented in the timeline as a color-coded tick mark. A scrolling window displays the chronological list of the entire event message text. Selecting one of the tick marks in the graphical timeline automatically highlights the corresponding event message text in the scrolling list, and displays a bar over the timeline of those events currently displayed in the scrolling window.

Figure 3.7-1. Event Display Window
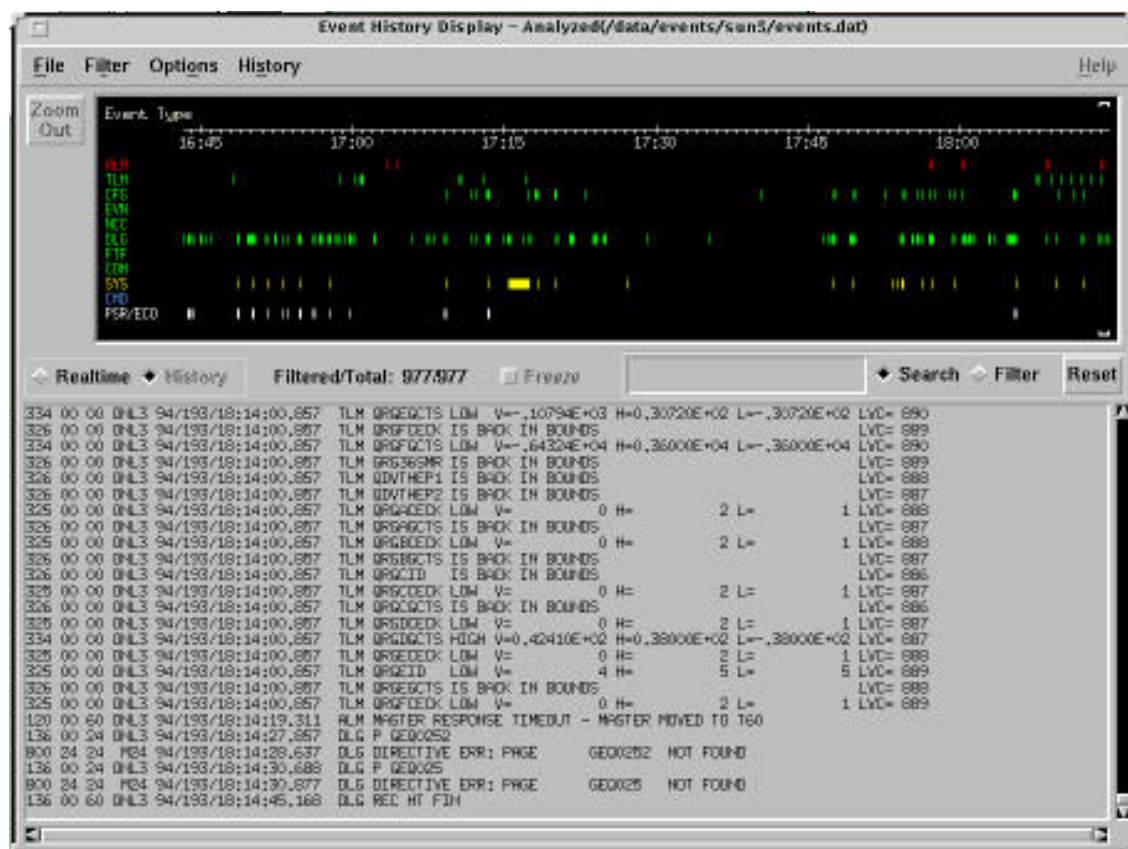
Events can be selected for a specific spacecraft, instrument type, subsystem and time period. The IST user can select time by zooming in on a time period in the graphical time line. The selected portion of the time line is expanded in the graphical area, and the event text scrolling window is modified to display only those events that occurred during the selected time frame. Zooming out returns to the original set of events.

The IST user may search the event text for a particular string, or filter for the interested string in all of the event text. A reset capability returns to the original set of events. When in real-time mode, the IST user may freeze the screen in order to examine an event more closely.

Menu options allow browsing, and selection of event files, printing of event reports, selection of one or more subsystems (Figure 3.7-2), and event types (Figure 3.7-3). The dialogs for the subsystems and event types allow filtering and event text to be bolded in the scrolling window.

Figure 3.7-2. Subsystem Dialog

Figure 3.7-3. Event Types Dialog

Figure 3.7-3. Event Types Dialog Another menu option invokes the event request window (Figure 3.7-4), which allows the IST user to request event history files by time period, subsystem, and event type. The IST user gives the requested file a name, and a target directory where the returned file from the Data Management System (DMS) will be placed. When the file arrives to the target directory, it is ready to be viewed in the event display.

Figure 3.7-4. Event History Request Window

3.8 Database Update & Browse

IST users will have the capability to view, update and report instrument-specific information maintained in the EOS AM1 project database (PDB). A user interface to the database to perform this function will be provided. IST users may request these functions from a database utilities menu.

To update and browse instrument-specific PDB definitions, the IST user must select the PDB EDIT option. Next, the user will be requested to choose the type of PDB definitions for editing, i.e. telemetry, command, activity, constraints.

Changes made to the telemetry, command and command-level constraint definitions will be made to temporary database tables. An update request to the DBA at the EOC through E-Mail is required to incorporate the changes that have been made. Once the submitted changes have met CCB approval, the DBA will load the updated definitions into the PDB at the EOC for validation and generation of the operational data.

Activity definitions and activity-level constraint definitions will utilize the Activity Definer Tool. Refer to Section 3.2.5.1.

Instrument-specific PDB report may be requested from the database utilities menu. The IST user may select to generate a complete instrument PDB report or select to generate a report containing all information about a particular instrument mnemonic. Additionally, the IST user may access reports that have been generated at the EOC which contain a listing of the entire PDB.

3.9 Tools

3.9.1 Document Reader

From an IST the user can access the document reader, which provides on-line documentation, including user guides, operational procedures, instrument commands, and spacecraft and instrument technical documents, in a hypertext format. One or more of these windows may be opened at any time.

A home page (table of contents) will appear with some hypertext (e.g., highlighted text) when document reader is started. The user can place the cursor on the highlighted text and click on it to pop to another part of the document (or separate document) relating to the text. The possible navigational schemes are; click on the Netscape button labeled "forward" to go forward, click on a Netscape button labeled "Back" (or hypertext "up") to go backwards, hypertext ">>" to page forward to the next document in linear order, hypertext "<<" to page backwards to the previous document in linear order, hypertext "Contents" to jump to a home page, and hypertext "Search" to jump to a fill-out form allowing search or find on a keyword. Search results will be displayed as hypertext document names to allow the user to immediately jump to a document. In addition, the Netscape pull down menu labeled "Go" can be popped up; it will keep track of where the user has been throughout a session and allow jumping to past locations.

Only an FOT document manager may add, update, and delete a document.

3.9.2 E-Mail

The IST user can send and receive mail electronically. Electronic mail (E-Mail) may be sent to multiple destinations including EOC and IST sites. E-mail may also be sent to a user or a user role (i.e., command activity controller, shift supervisor).

The user can view a list of received messages in the window that are sorted by their arrival date and time. Additionally, the messages can be sorted by author or subject/keyword. Messages can be saved to a local hard disk or deleted.

To view a message, the user can double click over a highlighted message and the message will appear in a popped up window. Once a message is either highlighted or its contents are shown, the user may reply to it. An editor will pop up and the user can cut, copy, paste, delete, and undo text. The message may be sent when the user has finished replying. A previous message or the next message can also be viewed.

In order to compose a message, the user may invoke the e-mail editor, type the message, and send the message. Files may be attached to a composed or replied message and sent.

3.9.3 Help

An IST user can obtain context sensitive hypertext help from any FOS window in the user interface. When invoked, the help window will pop up and the user will be able to browse a help document that will display help information pertinent to the display or activity the user is involved in when the user requests help. One or more Help window may be opened at any time.

A help page will appear with some hypertext (e.g., highlighted text) when the help window starts. The user can place the cursor on the highlighted text and click on it to pop to another part of the document (or separate document) relating to the help text. The possible navigational schemes are; click on the Netscape button labeled "forward" to go forward, click on a Netscape button labeled "Back" (or hypertext "up") to go backwards, hypertext ">>" to page forward to the next document in linear order, hypertext "<<" to page backwards to the previous document in linear order, hypertext "Contents" to jump to a home page, and hypertext "Search" to jump to a fill-out form allowing search or find on a keyword. Search results will be displayed as hypertext document names to allow the user to immediately jump to a document. In addition, the Netscape pull down menu labeled "Go" can be popped up; it will keep track of where the user has been throughout a session and allow jumping to past locations.
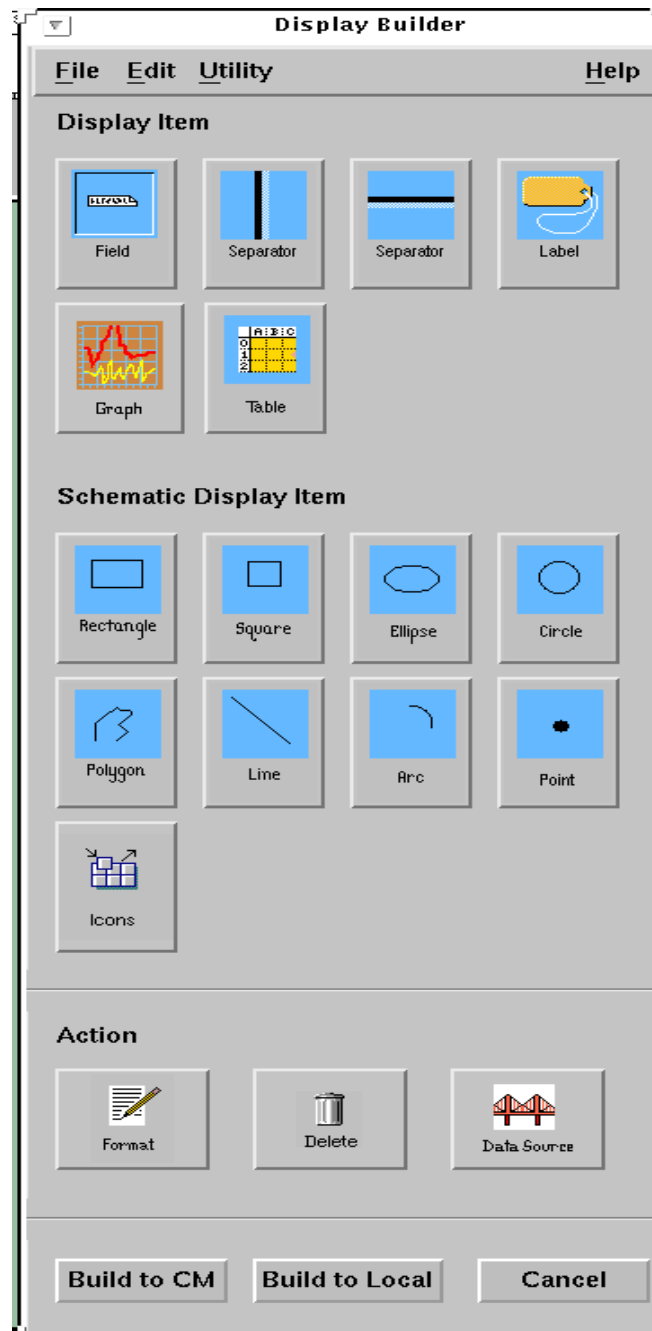
3.9.4 Display Builder

The IST user can build real-time displays that are dynamic pages by using the display builder tool. The display builder provides the user the flexibility to customize the dynamic page, which allows the user to become more efficient when analyzing real-time displays.

The display builder consists of two screens: the palette (Figure 3.9.4-1), and the display builder (Figure 3.9.4-2), which represents a dynamic page. The display builder palette contains display items that can be dragged and dropped onto the display builder: a field (i.e., telemetry values), a separator, a label, a graph, and a table. In addition, the IST user may draw schematics with these display items on the palette: a rectangle, a square, an ellipse, a circle, a polygon, a line, an arc, a point, and icons, which are the only drag and drop schematic display items. A field consists of a parameter's label, unit, value, and flags. The portions of a field are optional, except for value. An icon represents a graphical switch to which the user ties a parameter's discrete value. On a completely built dynamic page, the icon selected by the IST user will switch to its alternate icon if the discrete value changes.

The palette window also contains menu capabilities from which the dynamic page may be saved, created, printed, and edited. Once a display item has been created, the IST user may move, and in some cases resize the item on the display builder window. Items that can be resized are: separator, graph, table, rectangle, square, ellipse, circle, polygon, line, and arc.

Single and multiple data sources may be attached to a display item, and can represent real-time, replay, or simulation data (Figure 3.9.4-3). Other actions that can be performed upon a selected display item are to delete, or format the item. A format dialog for a display item is used to update the display item's attributes, change the position of a display item's bounding (highlighted, or selection) box, and tie a display item to a parameter's value(s). A parameter's value may be obtained from a subsystem filter located on the format dialog. One example of a format dialog is the circle format dialog (Figure 3.9.4-4). Figure 3.9.4-5 shows the effects upon the display builder window after a label and circle have been formatted.

When the IST user is finished designing the dynamic page, the user may build the page locally, or copy the file to Configuration Management. In either case, Data Management will store the contents of the file, which can be retrieved at any time by the IST user.

Figure 3.9.4-1. Display Builder Palette Window
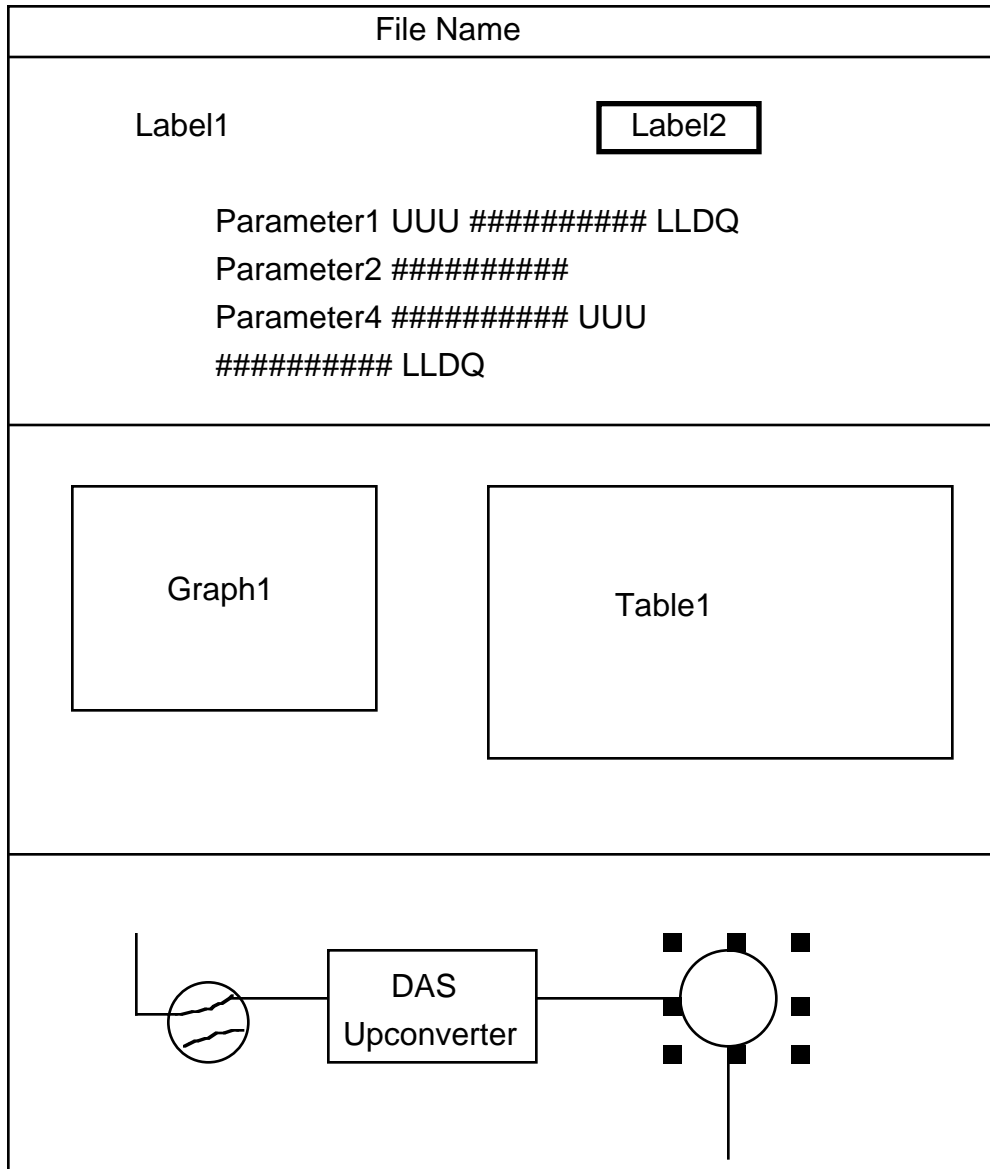
Figure 3.9.4-2. Display Builder Window (after drop)
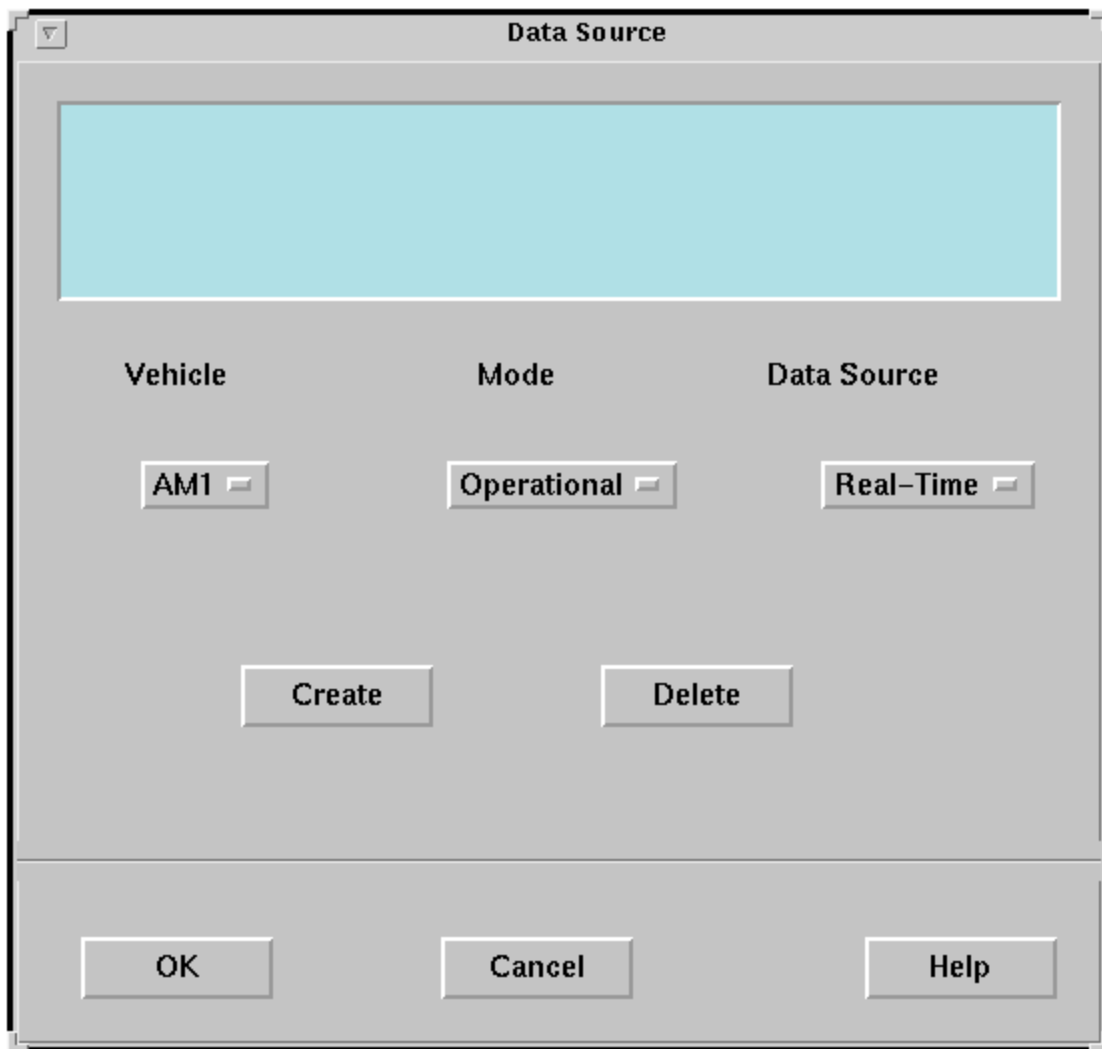
Figure 3.9.4-3. Data Source Dialog

Circle Attributes

X Position: 100   Y Position: 250

Width: 100   Height: 100

Line Thickness: 1

Line Style

◇ Solid
◇ OnOff Dash
◇ Double Dash

Fill Style

◇ Not Filled
◇ Filled
◇ Filling

Range

Start: 0

Color   Stop: 100

Data Source: Am1 Db010 R/T Oper   Select

Subsystem	Available Parameters	Selected Parameters
	Find	

Subsystem	Available Parameters	Selected Parameters
■ AM1	ACRBAT1I	ACRBAT1I
☐ ECOM	ACRBAT1T	
■ PM1	ACRBAT1V	
☐ EDOS	ACRBAT2I	
☐ FDF	ACRBAT2T	
	ACRBAT2V	
	ACRCMD	
	ACRPWR	

Filter   All   All->   ->   <   <- All

OK   Cancel   Help

Figure 3.9.4-4. Circle Format Dialog
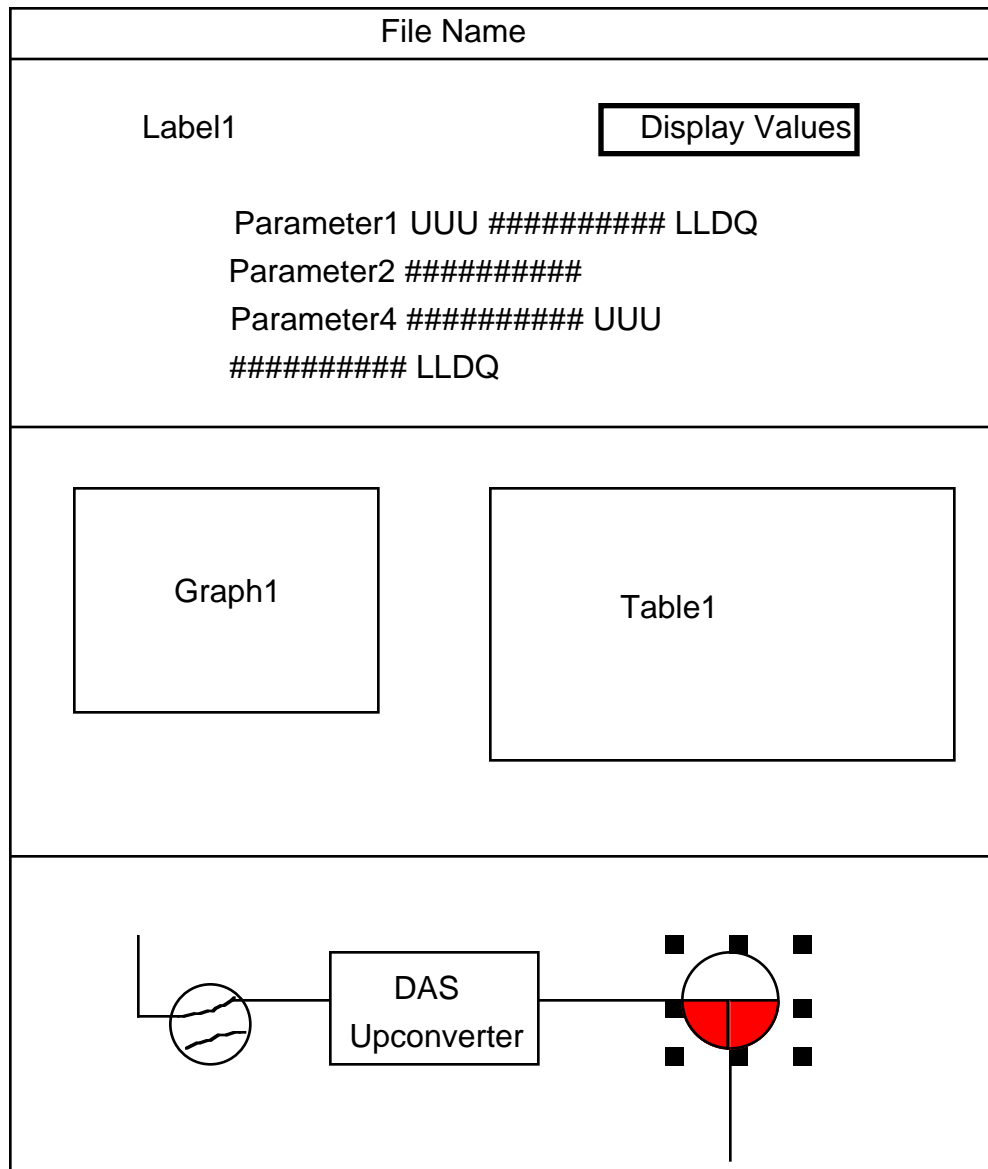
Figure 3.9.4-5. Display Builder Window (after format changes)

3.9.5 Quick Message Generator

The IST user can send messages an event using the Quick Message Generator window.   There are 3 message types: Information, Warning and Emergency. The user can type a message up to 240 characters in the message area of the window and choose a message type. Upon pressing the Send button, the message will be broadcast. The Quick Message event can be seen in the events scrolling area of the Control Window and in the Event Display window.